

Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

1. (Currently amended) A method for ~~cleaning a plasma etching apparatus manufacturing a semiconductor device, the method comprising the steps of:~~
~~forming a semiconductor film over a substrate;~~
~~forming a conductive film over the semiconductor film;~~
~~cleaning a chamber, the cleaning including:~~
filling a chamber with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas ~~wherein BO_x is adhered to an inside of the chamber as a residue;~~ and
generating plasma from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas ~~to remove the BO_x;~~
~~placing the substrate with the conductive film and the semiconductor film in the cleaned chamber; and~~
~~etching the conductive film in the cleaned chamber.~~
2. (Currently amended) A ~~The method for cleaning a plasma etching apparatus according to claim 1, wherein etching includes etching using a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method is adopted in the plasma etching apparatus.~~
3. (Currently amended) A ~~The method for cleaning a plasma etching apparatus according to claim 1, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃.~~

4. (Currently amended) A The method for cleaning a plasma etching apparatus according to claim 2 1, wherein the fluorine based gas is selected from the group consisting of CF₄, SF₆ and NF₃ further comprising interposing a gate insulating film between the semiconductor film and the conductive film.

5. (Currently amended) A The method for cleaning a plasma etching apparatus according to claim 1, wherein an etching gas is replaced cleaning includes replacing an etching gas within the chamber with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂.

6. (Currently amended) A The method for cleaning a plasma etching apparatus according to claim 2 1, wherein an etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine based gas each of which is added with O₂ cleaning includes removing BO_x from an inner surface of the chamber.

7. (Currently amended) A The method for cleaning a plasma etching apparatus according to claim 3 1, wherein an etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine based gas each of which is added with O₂ forming the semiconductor film over the substrate includes forming an island shaped semiconductor film over the substrate.

8. (Currently amended) A method for cleaning a plasma etching apparatus manufacturing a semiconductor device, the method comprising the steps of:
placing a substrate having a first conductive film and a second conductive film over the first conductive film within a chamber;

~~performing plasma etching using a gas containing BC₁₃ as an etching gas in a the first and the second conductive film within the chamber using an etching gas;~~

~~cleaning the chamber replacing the etching gas in the chamber with a plasma generated from Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas after the plasma etching second conductive film has been etched; and~~

~~generating plasma from the Cl₂ or the mixed gas of Cl₂ and the fluorine based gas etching the second conductive film within the cleaned chamber.~~

9. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 8, wherein etching includes a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method ~~is adopted in the plasma etching apparatus.~~

10. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 8, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃.

11. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 9 8, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃ at least one of the conductive films includes W.

12. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 8, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂.

13. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 9 8, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine based gas each of which is added with O₂ further comprising placing a dummy substrate in the chamber during cleaning.

14. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 10 8, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine based gas each of which is added with O₂ cleaning the chamber includes removing BO_x from an inner surface of the chamber.

15. (Currently amended) A method for cleaning a plasma etching apparatus manufacturing a semiconductor device, the method comprising the steps of:
placing a substrate having at least a conductive film including W within a chamber;
performing plasma etching using a gas containing BCl₃ as an etching gas in a chamber;
replacing the etching gas in the chamber with a mixed gas of Cl₂ and a fluorine-based gas or Cl₂ after the plasma etching; and
cleaning the chamber with a generating plasma generated from the a mixed gas of Cl₂ and the a fluorine-based gas or the Cl₂ before a plasma etching using a gas that is inhibited from generating plasma by BO_x as an etching gas; and
etching the conductive film within the cleaned chamber.

16. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 15, wherein etching includes a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method is adopted in the plasma etching apparatus.

17. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 15, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃.

18. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 16 15, wherein the fluorine based gas is selected from the group consisting of CF₄, SF₆ and NF₃ further comprising placing a dummy substrate in the chamber during cleaning.

19. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 15, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine based gas each of which is added with O₂, and cleaning the chamber includes generating the plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂.

20. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 16 15, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine based gas each of which is added with O₂ cleaning the chamber includes removing BO_x from an inner surface of the chamber.

21. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 17, wherein the etching the conductive film includes etching the conductive film with gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine based gas each of which is added with O₂, and a plasma is generated from a mixture of the Cl₂, or the mixed gas of Cl₂ and the fluorine based gas each of which is added with SF₆, and O₂.

22. (Currently amended) A method for ~~cleaning a plasma etching apparatus manufacturing a semiconductor device, the method comprising the steps of:~~

forming an insulating film over a substrate;

forming a conductive film over the insulating film;

~~performing plasma etching using a gas containing BCl₃ as an etching gas in a chamber;~~

~~replacing the etching gas in the chamber with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas after the plasma etching; and~~

~~cleaning a chamber with a generating plasma generated from the Cl₂ or the a mixed gas of Cl₂ and the a fluorine-based gas before performing plasma etching using a gas containing SF₆ as an etching gas;~~

placing the substrate with the conductive film and the insulating film into the cleaned chamber; and

etching the conductive film in the cleaned chamber.

23. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 22, wherein a method cleaning includes etching the chamber using an etching method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method is adopted in the plasma etching apparatus.

24. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 22, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃.

25. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 23 22, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃ further comprising forming a semiconductor film over the substrate and forming the insulating film over the semiconductor film.

26. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 22, wherein the etching gas is replaced cleaning includes replacing an etching gas within the chamber with the Cl₂ or a the mixed gas of Cl₂ and a the fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂.

27. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 23 22, wherein the etching gas is replaced cleaning includes replacing an etching gas within the chamber with the Cl₂ or a the mixed gas of Cl₂ and a the fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂.

28. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 24 22, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂ wherein forming the insulating film includes forming a gate insulating film over the substrate.

29. (Currently amended) A method for cleaning a plasma etching apparatus including a chamber, said method comprising the steps of:

filling the chamber with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas; and generating plasma from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas, wherein:

a part of the chamber is made from quartz, and
a surface of the quartz is at least partly exposed to an inside of the chamber,
generating the plasma includes applying a dielectric magnetic field generated from the electrode through the quartz adjacent the electrode;

wherein BO_x is adhered to the surface of the quartz at least partly exposed to the inside of the chamber as a residue.

30. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 29, further comprising etching the inside of the chamber with the generated plasma, wherein etching includes a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method is adopted in the plasma etching apparatus.

31. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 29, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃.

32. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 30 29, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃, further comprising placing a dummy substrate on a stage within the chamber while the chamber is being cleaned.

33. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 29, wherein:

filling the chamber with Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas includes filling the chamber an etching gas is replaced with the Cl₂ or a the mixed gas of Cl₂ and a the fluorine-based gas each of which is added with and adding O₂ to the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas, and such that the plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas, each of which is and the added with O₂.

34. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 30 32, wherein an etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂ the dummy substrate includes quartz.

35. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 31 29, further comprising wherein an etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂ the inside of the chamber with the generated plasma such that BO_x is removed from an inner surface of the chamber.

36. (Currently amended) A method for cleaning a plasma etching apparatus including a chamber, said method comprising the steps of:

performing plasma etching using a gas containing BCl₃ as an etching gas in the chamber;
replacing the etching gas in the chamber with a mixed gas of Cl₂ and a fluorine-based gas or Cl₂ after the plasma etching; and
generating plasma from the mixed gas of Cl₂ and the fluorine-based gas or the Cl₂,
wherein:

a part of the chamber is made from quartz, and
a surface of the quartz is at least partly exposed to an inside of the chamber,
generating the plasma includes applying a dielectric magnetic field generated from the electrode through the quartz adjacent the electrode.

37. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 36, further comprising etching the inside of the chamber with the generated plasma, wherein etching includes a method selected from the group consisting of an RIE etching

method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method is adopted in the plasma etching apparatus.

38. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 36, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃.

39. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 37 36, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃ further comprising placing a dummy substrate on a stage within the chamber while the chamber is being cleaned.

40. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 36, wherein:

filling the chamber with Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas includes filling the chamber the etching gas is replaced with the Cl₂ or a the mixed gas of Cl₂ and a the fluorine-based gas each of which is added with and adding O₂ to the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas, and such that plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas, each of which is and the added with O₂.

41. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 37 39, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine based gas each of which is added with O₂ dummy substrate includes quartz.

42. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 38 36, wherein the further comprising etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂ the inside of the chamber with the generated plasma such that BO_x is removed from the inside of the chamber.

43. (Currently amended) A method for cleaning a plasma etching apparatus including a chamber, said method comprising the steps of:

performing plasma etching using a gas containing BCl₃ as an etching gas in the chamber;

replacing the etching gas in the chamber with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas after the plasma etching; and

generating plasma from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas before performing plasma etching using a gas that is inhibited from generating plasma by BO_x as an etching gas,

wherein:

a part of the chamber is made from quartz, and

a surface of the quartz is at least partly exposed to an inside of the chamber, and

generating the plasma includes applying a dielectric magnetic field generated from the electrode through the quartz plate adjacent the electrode.

44. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 43, further comprising etching the inside of the chamber with the generated plasma, wherein etching includes a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method is adopted in the plasma etching apparatus.

45. (Currently amended) A The method for cleaning a plasma etching according to of claim 43, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃.

46. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 44 43, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃, further comprising placing a dummy substrate on a stage within the chamber while the chamber is being cleaned.

47. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 43, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂.

48. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 44 46, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂, dummy substrate includes quartz.

49. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 45 43, wherein the further comprising etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂, the inside of the chamber with the generated plasma such that BO_x is removed from the inside of the chamber.

50. (Currently amended) A method for cleaning a plasma etching apparatus including a chamber, said method comprising ~~the steps of:~~:

performing plasma etching using a gas containing BCl_3 as an etching gas in the chamber; replacing the etching gas in the chamber with Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas after the plasma etching; and

generating plasma from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas before performing plasma etching using a gas containing SF_6 as an etching gas,

wherein:

a part of the chamber is made from quartz, and

a surface of the quartz is at least partly exposed to an inside of the chamber, and

generating the plasma includes applying a dielectric magnetic field generated from the electrode through the quartz adjacent the electrode.

51. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 50, further comprising etching the inside of the chamber with the generated plasma, wherein etching includes a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method ~~is adopted in the plasma etching apparatus.~~

52. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 50, wherein the fluorine-based gas is selected from the group consisting of CF_4 , SF_6 and NF_3 .

53. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 51 50, wherein the fluorine-based gas is selected from the group consisting of CF_4 , SF_6 and NF_3 further comprising placing a dummy substrate within the chamber while the chamber is being cleaned.

54. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 50, wherein:

replacing the etching gas is replaced includes replacing the etching gas with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and

generating the plasma is generated includes generating the plasma from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂.

55. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 51 53, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂ dummy substrate includes quartz.

56. (Currently amended) A The method for cleaning a plasma etching apparatus according to of claim 52 50, wherein the further comprising etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂ the inside of the chamber with the generated plasma such that BO_x is removed from the inside of the chamber.

57. (Currently amended) A method for plasma etching manufacturing semiconductor devices, the method comprising the steps of:

manufacturing a first semiconductor device, the manufacturing including:

performing plasma etching of a conductive film using a gas containing BCl₃ gas as an etching gas in a chamber;

replacing the etching gas in the chamber with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas after the plasma etching; and

generating in the chamber a plasma from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas before performing plasma etching using a gas that is inhibited from generating plasma by BO_x as an etching gas to clean the chamber; and
manufacturing a second semiconductor device using the cleaned chamber.

58. (Currently amended) A The method for plasma etching according to of claim 57, wherein etching includes etching using a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method is adopted in the plasma etching apparatus.

59. (Currently amended) A The method for plasma etching according to of claim 57, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃.

60. (Currently amended) A The method for plasma etching according to of claim 58 57, wherein the fluorine based gas is selected from the group consisting of CF₄, SF₆ and NF₃ further comprising placing a dummy substrate in the chamber during cleaning.

61. (Currently amended) A The method for plasma etching according to of claim 57, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂.

62. (Currently amended) A The method for plasma etching according to of claim 58 57, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂ cleaning the chamber includes removing BO_x from an inner surface of the chamber.

63. (Currently amended) A The method for plasma etching according to of claim 59 60, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂ dummy substrate includes quartz.

64. (Currently amended) A method for plasma etching manufacturing semiconductor devices, the method comprising the steps of:

manufacturing a first semiconductor device, the manufacturing including:

performing plasma etching using a gas containing BC_l₃ gas as an etching gas in a chamber;

replacing the etching gas in the chamber with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas after the plasma etching; and

generating in the chamber plasma from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas to clean the chamber; and

manufacturing a second semiconductor device including performing plasma etching using a gas containing SF₆ gas as an etching gas.

65. (Currently amended) A The method for plasma etching according to of claim 64, wherein etching includes a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method is adopted in the plasma etching apparatus.

66. (Currently amended) A The method for plasma etching according to of claim 64, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃.

67. (Currently amended) A The method for plasma etching according to of claim 65 64, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃, further comprising placing a dummy substrate in the chamber during cleaning.

68. (Currently amended) A The method for plasma etching according to of claim 64, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂.

69. (Currently amended) A The method for plasma etching according to claim 65 64, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂ cleaning the chamber includes removing BO_x from an inner surface of the chamber.

70. (Currently amended) A The cleaning method for plasma etching apparatus according to of claim 66 67, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂ dummy substrate includes quartz.

71. (Currently amended) A method for plasma etching manufacturing semiconductor devices using a plasma etching apparatus including a chamber, said method comprising the steps of:

manufacturing a first semiconductor device, the manufacturing including:

performing plasma etching using a gas containing BCl₃ as an etching gas in the chamber;

replacing the etching gas in the chamber with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas after the plasma etching;

generating in the chamber plasma from Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas to clean the chamber; and

manufacturing a second semiconductor device using the cleaned chamber, the manufacturing including:

performing plasma etching using a gas that is inhibited from generating plasma by BO_x as an etching gas,

wherein:

a part of the chamber is made from quartz, and

a surface of the quartz is at least partly exposed to an inside of the chamber, and

generating the plasma includes applying a dielectric magnetic field generated from the electrode through the quartz adjacent the electrode.

72. (Currently amended) A The method for plasma etching according to of claim 71, further comprising etching the inside of the chamber with the generated plasma, wherein etching includes a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method is adopted in the plasma etching apparatus.

73. (Currently amended) A The method for plasma etching according to of claim 71, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃.

74. (Currently amended) A The method for plasma etching according to of claim 72 71, wherein the fluorine based gas is selected from the group consisting of CF₄, SF₆ and NF₃, placing a dummy substrate within the chamber during cleaning.

75. (Currently amended) A The method for plasma etching according to claim 71, wherein:

replacing the etching gas in the chamber with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas includes replacing the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas, each of which is added with and O₂, and

generating the plasma is generated includes generating the plasma from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas, and the each of which is added with O₂.

76. (Currently amended) A The method for plasma etching according to of claim 72 74, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine based gas each of which is added with O₂ dummy substrate includes quartz.

77. (Currently amended) A The method for plasma etching according to of claim 74 71, wherein the further comprising etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine based gas each of which is added with O₂ the inside of the chamber with the generated plasma such that BO_x is removed from an inner surface of the chamber.

78. (Currently amended) A method for plasma etching manufacturing semiconductor devices using a plasma etching apparatus including a chamber, said method comprising the steps of:

manufacturing a first semiconductor device, the manufacturing including:

performing plasma etching using a gas containing BC_l₃ as an etching gas in the chamber;

replacing the etching gas in the chamber with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas after the plasma etching; and

generating in the chamber plasma from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas to clean the chamber; and

manufacturing a second semiconductor device using the cleaned chamber, the manufacturing including:

performing plasma etching in the cleaned chamber using a gas containing SF₆ gas as etching gas,

wherein:

a part of the chamber is made from quartz, and

a surface of the quartz is at least partly exposed to an inside of the chamber, and

generating the plasma includes applying a dielectric magnetic field generated from the electrode through the quartz adjacent the electrode.

79. (Currently amended) A The method for plasma etching according to of claim 78, further comprising etching the inside of the chamber with the generated plasma, wherein etching includes a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method is adopted in the plasma etching apparatus.

80. (Currently amended) A The method for plasma etching according to of claim 78, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃.

81. (Currently amended) A The method for plasma etching according to of claim 79 78, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃, further comprising placing a dummy substrate within the chamber while the chamber is being cleaned.

82. (Currently amended) A The method for plasma etching according to of claim 78, wherein:

the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and

the plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂.

83. (Currently amended) A The method for plasma etching according to of claim 79 81, wherein the ~~etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂ dummy substrate includes quartz.~~

84. (Currently amended) A The method for plasma etching according to of claim 80 78, wherein the further comprising etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂ the inside of the chamber with the generated plasma such that BO_x is removed from the inside surface of the chamber.

85. (Original) A method for manufacturing a semiconductor device comprising the steps of:

laminating a first conductive film and a second conductive film in sequence over an island shape semiconductor film with a gate insulating film interposed therebetween;

etching the first conductive film and the second conductive film to form a first shape of the first conductive film and a first shape of the second conductive film, respectively, by using a first etching gas;

replacing the first etching gas in a chamber with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas wherein BO_x is adhered to an inside of the chamber as a residue; and

generating plasma from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas to remove the BO_x; and

anisotropic etching the first shape of the first conductive film and the first shape of the second conductive film to form a second shape of the first conductive film and a second shape of the second conductive film, respectively.

86. (Original) A method for manufacturing a semiconductor device according to claim 85, wherein a width of the second shape of the first conductive film is longer than that of the second shape of the second conductive film in a channel length direction.

87. (Original) A method for manufacturing a semiconductor device according to claim 85, wherein a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method is adopted in the plasma etching apparatus.

88. (Original) A method for manufacturing a semiconductor device according to claim 86, wherein a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method is adopted in the plasma etching apparatus.

89. (Original) A method for manufacturing a semiconductor device according to claim 85, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃.

90. (Original) A method for manufacturing a semiconductor device according to claim 86, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃.

91. (Original) A method for manufacturing a semiconductor device according to claim 87, wherein the fluorine-based gas is selected from the group consisting of CF₄, SF₆ and NF₃.

92. (Original) A method for manufacturing a semiconductor device according to claim 85, wherein an etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas, or Cl₂ gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂ to remove the BO_x.

93. (Original) A method for manufacturing a semiconductor device according to claim 86, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂ to remove the BO_x.

94. (Original) A method for manufacturing a semiconductor device according to claim 87, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂ to remove the BO_x.

95. (Original) A method for manufacturing a semiconductor device according to claim 89, wherein the etching gas is replaced with Cl₂ or a mixed gas of Cl₂ and a fluorine-based gas each of which is added with O₂, and plasma is generated from the Cl₂ or the mixed gas of Cl₂ and the fluorine-based gas each of which is added with O₂ to remove the BO_x.